

REMARKS

Claims 1-22 are pending. Claims 1, 4, 5, 8, 11, 12, and 15-20 have been amended.

In the Office Action mailed December 3, 2003, the Examiner found the oath and declaration to be defective due to non-dated and/or non-initialed alterations. In response, Applicants are preparing a supplemental oath or declaration. As the inventors are from the United Kingdom, Applicants are presently contacting the necessary inventors for execution of the supplemental oath or declaration. Once signed, Applicants will submit this supplemental oath or declaration as soon as possible in order to cure the defect noted by the Examiner.

The Examiner objected to the specification for failing to discuss Figure 4, and to claims 4-8, 11, and 15-22 in view of various informalities. Applicants have amended the specification and claims 4, 5, 8, 11, and 15-20 to address these informalities.

The Examiner rejected claim 11 under 35 U.S.C. §112, first paragraph and second paragraph for failing, respectively, to comply with the written description requirement and indefiniteness requirements. The Examiner rejected claims 1-8, and 12-22 under 35 U.S.C. §103(a) as obvious in view of U.S. Patent No. 6,058,489 to Schultz et al. (hereinafter "Schultz") and U.S. Patent No. 5,671,390 to Brady et al. (hereinafter "Brady"). The Examiner rejected claims 1-10 and 12-22 under 35 U.S.C. §103(a) as obvious in view of U.S. Patent No. 5,758,118 to Choy et al. (hereinafter "Choy") and Brady.

Applicants have amended claims 1, 4, 5, 8, 11, 12, and 15-20 to clarify the invention and to comply with the objections of the Examiner.

REJECTION OF CLAIMS 11 UNDER 35 U.S.C. §112, 1st and 2nd paragraphs

The Examiner rejected claim 11 under 35 U.S.C. §112, 1st and 2nd paragraphs for written description and indefiniteness requirements. Applicant has amended claim 11 to clarify the subject matter of the claim and address the antecedent basis concerns raised by the Examiner. Applicant asserts that these amendments clarify that the LSA controller controls a RAID system having an architecture according to level 5. *See* Specification page 11, line 9. The claim recites the prevailing industry abbreviation for this idea, RAID 5. Therefore, Applicants respectfully

assert that claim 11 satisfies the written description requirement under 35 U.S.C. §112, 1st paragraph. Furthermore, Applicants respectfully assert that claim 11 is sufficiently definite as the amendments clarify what Applicants regard as their invention. Applicants request that these rejections be withdrawn.

REJECTION OF CLAIMS 1-8 and 12-22 UNDER 35 U.S.C. §103(a) IN VIEW OF SCHULTZ
AND BRADY

The Examiner rejected claims 1-8 and 12-22 under 35 U.S.C. §103(a) in view of Schultz and Brady. Applicants respectfully traverse this rejection.

Prima Facie Obviousness.

"It is insufficient that the prior art disclosed the components of the patented device, either separately or used in other combinations; there must be some teaching, suggestion, or incentive to make the combination made by the inventor." *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 934 (Fed. Cir. 1990). To establish *prima facie* obviousness, there must be some suggestion or motivation to modify the reference or to combine reference teachings to arrive at the claimed invention. "The teaching or suggestion to make the claimed combination ... must be found in the prior art, not in applicant's disclosure." MPEP 2143, citing *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Applicants assert that a *prima facie* case of obviousness has not been made because neither Shultz nor Brady include a suggestion or motivation to modify or combine these references to arrive at the claimed invention.

In order to advance prosecution, However, Applicants have amended claims 1, 12, 16, and 20 (hereinafter "the independent claims") to clarify a distinct difference between the prior art and the present invention. Specifically, claim 1, representative of the independent claims, recites in part, "the LSA controller further defining a directory which specifies storage locations using relative addresses."

Support for this amendment is found throughout the specification. First, the function of a LSA directory is described. *See* specification page 3, lines 7-10. Next, the specification describes a difference in addressing modes for locating the storage locations. Specifically, it is noted that, in certain implementations, tracks are identified in an LSA directory using the stripe number and the offset into the stripe. *See* specification page 16, lines 16-19. This method of locating tracks is contrasted with conventional methods that employ a logical block address.

A stripe number plus an offset is one example of a relative addressing mode that may be used by the present invention. Relative addressing is well known in the art and is clear from the specific example set forth in the specification. *See Id.* In relative addressing, a location of interest is determined by adding an offset to an absolute or base address. *See* www.webopedia.com "relative address." The actual address is relative to the base address.

In the present invention, the RAID array comprises a two-dimensional array with rows corresponding to stripe numbers and segment-columns corresponding to strips. *See* specification page 2, lines 18-29, Figures 2-4. While the segment-columns do not necessarily map to boundaries for storage locations such as tracks, the use of stripe numbers as the absolute address allows the number of strips to change, through adding or removing a storage device, without requiring changes to that the addresses currently in the LSA directory. None of the current addresses need to change because the base addresses, the location of the first strip in a stripe, identified by the stripe number does not change.

In contrast, conventional LSA storage subsystems, represented by Brady, use an absolute address to track locations of storage structures such as tracks. As is well known, an absolute address is an address to a fixed location in the storage device (memory, disk, etc.). *See* www.webopedia.com "absolute address."

Reference in the specification to a logical block address is one example of an absolute addressing mode used in the prior art. Of course the term block may be replaced by track or any other addressable storage unit. Each logical block address is a physical address indicating a sequential number of blocks from a single starting location, such as the first block in the RAID array. The problem caused by such an addressing mode in LSA controlled RAID arrays is that

adding or removing a strip at the end of each stripe causes each strip after the first stripe to have a different address. *See* specification page 20, line 21 – page 21, line 2.

Regarding Claims 4, 15, and 19

The concept of relative addressing is specifically claimed in claims 4, 15, and 19 according to one implementation. Representative claim 4 recites that the directory identifies logical tracks by the stripe number and offset. The Examiner submits that this concept is taught in Brady Col. 2, lines 30-31 and 1-7.

Applicants respectfully submit that Brady clearly teaches and discloses a direct addressing mode. Brady, does not describe the memory addressing mode for tracks in the LSA directory in great detail. This is because Brady focuses on an LSA controller and method for reducing the size of an LSA directory that must be retained in RAM. Instead of the whole LSA directory, Brady teaches storing sub-directories that include the most recently accessed logical tracks.

What Brady does describe about addressing in the LSA directory indicates that the addressing is done using conventional direct addressing. Those of skill in the art recognize that in discussions of addressing modes the standard widely used, direct addressing, is presumed unless relative addressing is specifically stated or clearly evident by use of an absolute address and an offset.

In Brady, logical addressing is discussed in the paragraph beginning on line 59 of Col. 1. Logical addresses are again mentioned in Col. 2 lines 1-7. It is well known that the term “logical” refers to the difference between how a host application addresses tracks or blocks and how the physical tracks of the physical devices are organized. Logical addressing is not relative addressing. There is no base address and/or offset disclosed in Brady that would indicate relative addressing.

Instead, Brady makes clear that direct addressing is used by referring to mappings between logical addresses and physical addresses. Brady states “the LSA directory...indicates the current physical location of data associated with each logical track on the disks.” *See* Brady Col. 2, lines 29-31. Again there is no discussion of a base address or an offset. Because Brady

refers to a physical location of tracks on the disks, Brady clearly teaches and discloses direct addressing within the LSA directory.

The Examiner submits that the description of how segments and segment-columns are organized in Brady (*See* Brady Col. 2, lines 1-7) discloses the concept of a relative address recited in claim 4. Applicants respectfully disagree. Claim 4 states "...specifies the location of a logical track in terms of the ID of the stripe to which the track belongs and the offset of the track within the stripe." *See* Claim 4. The Examiner compares the offset claimed to the column or segment-column of the logical track. *See* Office Action, page 6, last paragraph. Applicants find no discussion in Brady, however, for addressing logical or physical tracks using a segment and column or segment-column within the LSA directory.

Furthermore, Brady teaches that a segment is a combination of all segment-columns from the disks and a segment-column is a single cylinder on each disk. It is well known that a segment-column or cylinder includes multiple physical tracks, one for each platter. So, under the Examiner's interpretation of Brady, addresses in an LSA directory denoting a segment and column are unable to identify/address a single track.

Therefore, such an addressing scheme can not be used in Brady because each track (logical and/or physical) must be individually locatable because the location of a track changes over time. *See* Brady Col. 2, lines 26-27. The closest such addresses come is a segment-column having multiple tracks within a specific disk.

Therefore as discussed above, Brady fails to teach or disclose a relative addressing mode for addresses in the LSA directory as claimed in amended claim 1 and set forth in one embodiment recited in claims 4, 15, and 19.

As noted by the Examiner, Schultz fails to teach or disclose an LSA controller that includes an LSA directory. Schultz teaches the on-line expansion or contraction of a RAID-4 or RAID-5 array. Schultz includes reconfiguring the RAID array in view of the changed size by moving stripes to temporary storage and then back to the RAID array in different locations. *See* Schultz Abstract.

Therefore, Applicants respectfully submit that neither Schultz nor Brady teach or disclose use of a relative addressing mode in the LSA directory of an LSA controller operating a RAID

array. This concept is recited in amended claims 1, 12, 16, and 20 and further defined in claims 4, 15, and 19. Applicants respectfully assert that the amended independent claims are allowable in view of Schultz and Brady.

Claims 2-8, 13-15, 17-19 and 21-22 depend directly or indirectly from the independent claims. Therefore, Applicants respectfully assert that claims 2-8, 13-15, 17-19 and 21-22 are allowable for at least the same reasons as the independent claims.

REJECTION OF CLAIMS 1-10 and 12-22 UNDER 35 U.S.C. §103(a) IN VIEW OF CHOY AND BRADY

The Examiner rejected claims 1-10 and 12-22 under 35 U.S.C. §103(a) in view of Choy and Brady. Applicants respectfully traverse this rejection.

Prima Facie Obviousness.

As stated above, the references must teach or suggest the combination. Applicants assert that a *prima facie* case of obviousness has not been made because neither Choy nor Brady include a suggestion or motivation to modify or combine these references to arrive at the claimed invention.

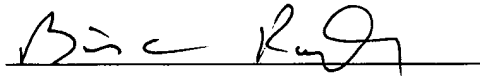
However, in order to advance prosecution, the independent claims have been amended as described above. Also as described above, the amendment regarding relative addressing further clarifies and distinguishes the present invention. As observed by the Examiner, Choy fails to teach or disclose an LSA controller that includes directory. Instead, Choy describes expansion of a RAID-5 array that remaps parity tracks with little or no movement of RAID data. *See* Choy Abstract.

Therefore, Applicants respectfully submit that neither Choy nor Brady teach or disclose use of a relative addressing mode in the LSA directory of an LSA controller operating a RAID array. This concept is recited in amended claims 1, 12, 16, and 20 and further defined in claims 4, 15, and 19.

Claims 2-10, 13-15, 17-19 and 21-22 depend directly or indirectly from the independent claims. Therefore, Applicants respectfully assert that claims 2-10, 13-15, 17-19 and 21-22 are allowable for at least the same reasons as the independent claims.

In view of the foregoing, Applicant submits that the application is in condition for immediate allowance. In the event any questions remain, the Examiner is respectfully requested to initiate a telephone conference with the undersigned.

Respectfully submitted,



Brian C. Kunzler
Reg. No. 38,527
Attorney for Applicant

Date: March 3, 2004

KUNZLER AND ASSOCIATES
8 East Broadway, Suite 600
Salt Lake City, UT 84111
Telephone: 801/994-4646

G:\Client Files\1200 SanJose\1240\OAR1\1240.OAR1.doc